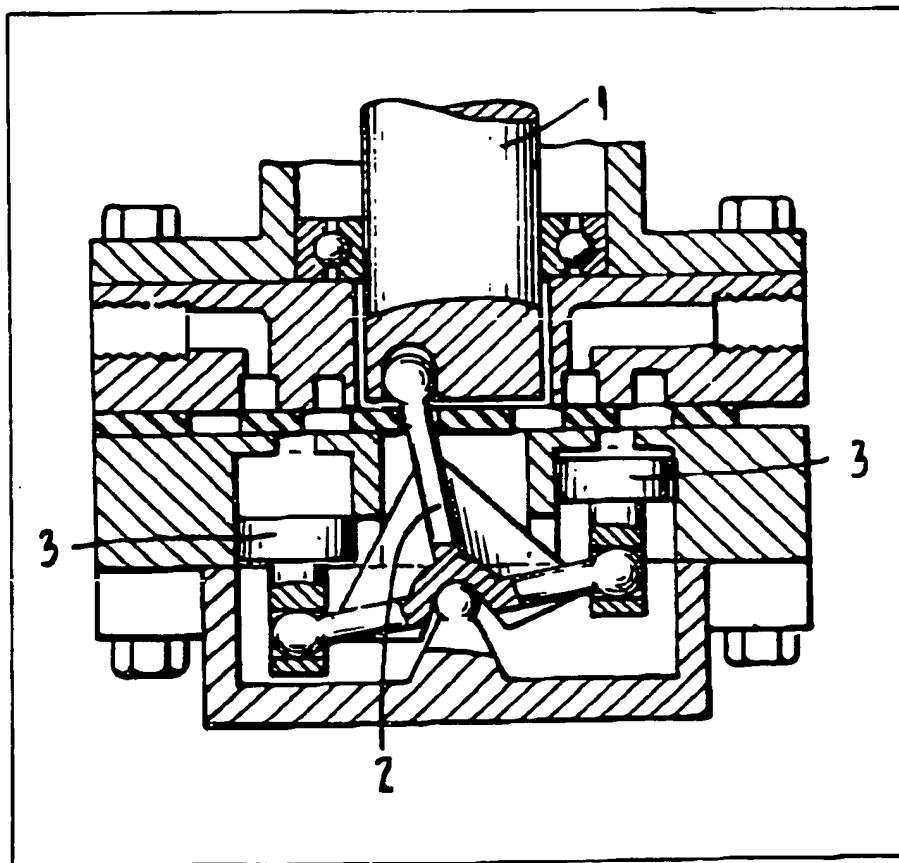


- (21) Application No 7839121
(22) Date of filing 3 Oct 1978
(23) Claims filed 3 Oct 1978
(30) Priority data
(31) 60128/78
(32) 22 Sep 1978
(33) Australia (AU)
(43) Application published
2 Apr 1980
(51) INT CL.
F16H 23/04
(52) Domestic classification
F2K 481A 9
(56) Documents cited
GB 538508
GB 538505
(58) Field of search
F2K
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(54) Wobbler type cranking system

(57) Rotary motion of a shaft 1 is converted into linear reciprocating motion of pistons 3, or vice-versa, by means of a multiple bell crank lever 2 comprising two or more first arms connected at a fulcrum and radiating in a plane and a single second arm connected to the first arms at said fulcrum and extending along a radius perpendicular to said plane.

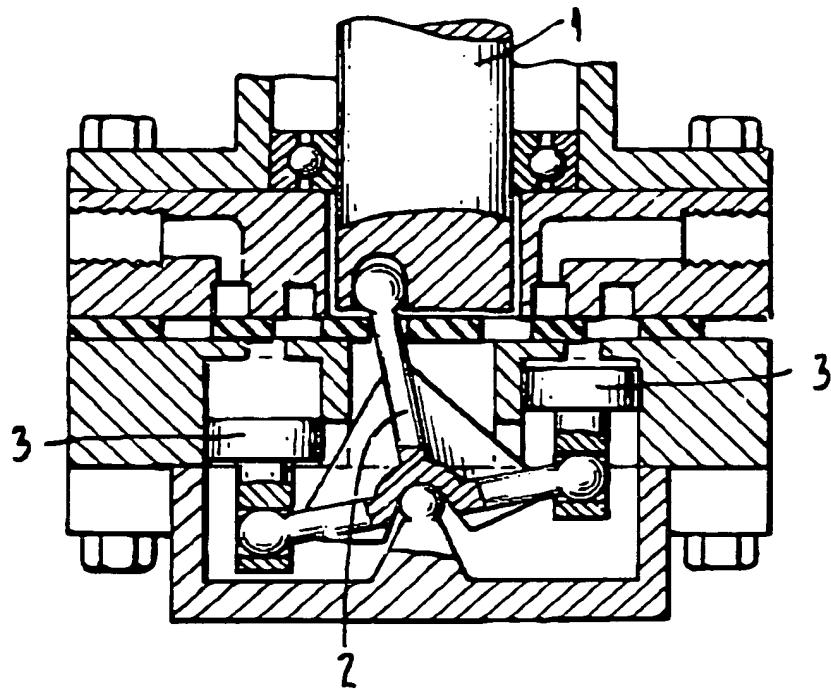


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SPECIFICATION

Cranking systems

- 5 The present invention relates to cranking systems for converting rotary motion to linear reciprocating motion and vice-versa.
- 10 There are many fields in mechanics which involve the conversion of rotary motion to linear reciprocating motion and vice versa. Such fields include hydraulic motors, various pumps and internal combustion engines. Such mechanisms for the conversion of the one form of motion to the other often involve a number of components such as cam mechanisms, 15 crank shafts and connecting rods. An object of the present invention is to provide a simple cranking system for the conversion of the one form of motion to the other which is capable of eliminating some or all of the components used in the motion conversion 20 mechanisms of the prior art.

- According to the present invention there is provided a cranking system for converting rotary motion to linear reciprocating motion or vice versa comprising a multiple bell crank lever (as herein 25 defined) so arranged that the fulcrum is located, by means of a pivotal connection, on the housing for two or more reciprocating members, or on a member rigidly connected to said housing, the ends of the first radiating arms being pivotally connected 30 to respective reciprocating members, the end of the remaining, second arms being pivotally connected to a rotating member at a position on the plane of rotation of said rotating member eccentric to the axis of rotation thereof.

- 35 A multiple bell crank lever is defined as consisting of two or more first arms connected at a central fulcrum point and radiating substantially in the same plane from said fulcrum point, and a single second arm connected to said first arms at said fulcrum 40 point and extending therefrom along a radius substantially at right angles to the plane of said first radiating arms. Thus it will be appreciated that the single second arm and each of the first radiating arms form a bell crank lever.

- 45 An embodiment of the invention will now be described, by way of example, with reference to the single Figure of the accompanying drawings, which shows a side view, mainly in section, through a cranking system according to the invention.

- 50 Referring to the drawing there is shown a cranking system for converting rotary motion of a shaft 1, by means of a multiple bell crank lever 2, into double acting linear reciprocating motion of a pair of pistons 3.

- 55 It will be apparent that other systems may be designed incorporating a multiple bell crank lever with three or more first radiating arms. In such multiple throw systems the crank may drive, or be driven by, a rotating shaft thus allowing the unit to be used 60 as a motor or load sensitive torque converter.

A multiple throw crank married to an in-line block, the cylinders arranged in a circular pattern, will give

a constant and progressive torque output. If a slint is introduced to alter the degree of eccentricity of the cam, then the output torque may be infinitely variable. Further variations may be made in swept volume, pressures, strokes, cylinder diameter and cylinder position which may result in many different functions being possible within one

- 70 pump/motor/valve system.

- It will be apparent to a person skilled in the art that the present invention provides many advantages and economies compared to prior systems. Such advantages can be illustrated by comparing a conventional in-line swash plate hydraulic motor, as 75 standard, and with the substitution of this component. The component replaces the following parts: rotating cylinder block, piston shoe, shoe retainer plate, swash plate and eliminates the need for large 80 area low friction bearing faces and piston shear forces that must be contended with. Material savings are obvious from the reduced component list, and there are further savings in machining time and tolerancing. As this component does not rotate but 85 oscillates, there is a proportional reduction in wear and so an increase in service life.

CLAIMS

1. A cranking system for converting rotary motion to linear reciprocating motion or vice versa 90 comprising a multiple bell crank lever (as herein defined) so arranged that the fulcrum is located, by means of a pivotal connection, on the housing for two or more reciprocating members, or on a member rigidly connected to said housing, the ends 95 of the first radiating arms being pivotally connected to respective reciprocating members, the end of the remaining, second arm being pivotally connected to a rotating member at a position on the plane of rotation of said rotating member eccentric to the axis of 100 rotation thereof.

2. A system according to claim 1 wherein said multiple bell crank is married to an in-line cylinder block with the cylinders arranged in a circular pattern.

- 105 3. A system according to claim 1 or claim 2 in the form of a motor wherein said multiple bell crank operates to drive a rotating member.

4. An hydraulic pump incorporating a system according to any one of claims 1 to 3.

- 110 5. An hydraulic motor incorporating a system according to any one of claims 1 to 4.

6. An internal combustion engine incorporating a system as claimed in any one of claims 1 to 4.

- 115 7. A cranking system substantially as herein described with reference to the accompanying drawing.

Printed for Her Majesty's Stationery Office by The Timesdale Press Ltd.,
Barnack-upon-Trent, LE19 1BB.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
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